

## Comparison of citronella oil extraction methods from *Cymbopogon nardus* grass by ohmic-heated hydro-distillation, hydro-distillation, and steam distillation

### ABSTRACT

A proposed method for citronella oil extraction was developed with the application of ohmic heated hydro-distillation. The objective was to compare the performance of three different extraction methods, viz. ohmic heated hydro-distillation, hydro-distillation, and steam distillation. The maximum amount of extracted oil yield by ohmic heated hydro-distillation was 7.64 mL/kWh as compared to hydro-distillation and steam distillation methods that resulted oil yields of 3.87 mL/kWh and 1.69 mL/kWh, respectively. The kinetics of extraction followed a second-order model. Gas chromatography-mass spectrometry analysis found that the major constituents of citronella oil (GC-MS) for the different extraction methods were citronellal, citronellol, and geraniol. Scanning electron microscopy (SEM) of citronella grass provided evidence that the lignocellulosic sources of the extracted citronella oil were schizogenous cavities and cellular lignin. The citronella that had undergone ohmic-heated hydro-distillation and steam distillation showed some microfractures and less cell wall degradation than hydro-distillation. The cell walls were less rigid using ohmic-heated hydro-distillation compared to steam distillation. However, the cell walls of the hydro-distillation sample were less dense and exhibited pronounced swelling, but did not show any microfractures.

**Keyword:** Kinetics; Ohmic-heated hydro-distillation; Extraction; Citronella structural changes